# IX. *An Account of ſome* Electrical Experiments *made before the* ROYAL SOCIETY *on* Thurſday *the 16th of* February 1737-8. *By the Same.*

## EXPERIMENT I.

### TAB. I. Fig. I.

I Took the Glaſs Tube *AB* of two Inches Diameter, which had at one End *A*, a Braſs Ferril with a Brim cemented to it, and at the other End *B*, a Braſs Cap cloſe at Top, the Braſs-work being join'd to it, in order to exhauſt it of its Air upon Occaſion. When this Tube was very dry, it would become electrical by rubbing, ſo as to ſnap by paſſing the Ends of the Fingers near it; but that Virtue could not be excited in the Tube nearer the Braſs at the Ends than from *a* to *b*, and not unleſs the Tube was very dry within.

The Tube being thus prepar'd, and having an Ivory Ball *C*, of about two Inches Diameter, tied to it at the End *B* by a ſhort String, I paſſed the Tube through the horizontally ſuſpended Plate *DD*, till it was ſtopp'd by the Brim at *A*; and as it hung perpendicularly, the Ball *C* was within a Foot and an half of the Floor. The Plate *DD* was about 10 Inches in Diameter, and ſuſpended by three ſmall Cat-gut Strings as *E*, *e*, of about two Feet in Length, all which were tied together at *E*, to an hempen String hanging from the Cieling at *F*.

By reaſon of the Diſtance of the Ends of the Cat-gut Strings cloſe to the Plate at *eee*, I was able to thruſt in between them one End of an open Tube *GG*, after I had rubb'd it ſo as to make it electrical, to ſee whether I could make the aforeſaid ſuſpended Tube *AB* the Conductor of Electricity to the Ball *C*; but the firſt Trial was in vain.

### EXPERIMENT II.

Then laying horizontally over the Plate *DD* an Iron Bar a quarter of an Inch thick, and a Yard long, I hung at the Ends of it two Ivory Balls *cc*, of the ſame Size as *C*, by Packthreads of the ſame Length as the Tube *AB*.

Having again made the Tube *GG* electrical, I applied it over *A*, as before, and immediately the two Balls *cc* received the Electricity, ſo as to attract the *Thread of Trial T* hanging at the End of the Stick *ST*, when applied near them; though it received no Motion when applied to *C*. But if the Strings *Hc*, inſtead of Packthread, were Cat-gut, then the Balls *cc* received no Electricity from the Tube *GG* rubb'd and applied over *A*.

*N. B.* To be ſure that the rubb'd Tube is made electrical, I paſs my Fingers near it after rubbing, to hear whether it ſnaps; but always rub again before I apply it; becauſe by ſnapping it loſes its Electricity at the Place where it ſnaps.

### EXPERIMENT III.

When I rubb'd the Tube *AB*, it would then attract the Thread of Trial *T* between *a* and *b*; but not at all

all above *a* or below *b*, unleſs when I applied the Tube *GG* above *A*: Then the Thread of Trial would be attracted by the Plate *DD*, and the Top of the great Tube from *A* to *a*, but no lower. It would alſo be attracted by all the Bar *HH*, and only three or four Inches below *H*.

## EXPERIMENT IV.

Having fill'd the Tube *AB* with Water, the Electricity of the rubb'd Tube *GG*, applied at *A*, ran ſtrongly down the Tube *AB*, and impregnated the Ball *C*, ſo as to make it ſtrongly attract the Thread of Trial, whilſt the Balls *cc* received no Virtue at all. But upon wetting the Cat-gut Strings *Hc* with a Spunge, all the three Balls *cC* and *c* ſtrongly receiv'd the electrical Virtue.

## EXPERIMENT V.

I took away the Bar *HH*, and its Balls and Strings; and having well dried the Tube, I rubb'd it, and hung it up as before; ſo that it would ſnap, or attract the Thread from *a* to *b*, but no-where elſe.

Then putting the ſmall Bar *HH* into the Middle of the Tube *AB* in its Axis repreſented by the prick'd Line, upon Application of the rubb'd Tube *GG* at *A*, the Virtue was immediately communicated to the Ball *C*. The ſame thing happen'd, when, inſtead of the Bar, a Braſs Wire, a Walking-Cane, a ſmall green Stick, or ſmall Packthread, was placed in the Axis of the Tube.

## EXPERIMENT VI.

I took a Barometer Tube empty, and very dry, and placed it in the Axis of the great Tube *AB*; but it would conduct no Electricity to the Ball *C*; though it carried it down very readily when full of Water, though quite dry on the Outſide.

Another ſmall Tube open at both Ends, which conducted no Virtue to *C* when dry, being only moiſten'd a little by the Breath in blowing through it, carried down the Virtue from *A* to *C* very ſtrongly.

*N. B.* All this while the Cat-gut Strings *Ee* received no electrical Virtue.

As I deſign to purſue theſe Inquiries much further, I beg Leave to be allow'd to make uſe of ſome Terms, (which I ſhall here define) in order to ſave uſing many Words in giving an Account of ſome electrical Experiments, which I have made, and ſhall hereafter make.

## DEFINITION I.

A Body *electrical per ſe* is ſuch a Body in which one may excite Electricity by Rubbing, Patting, Hammering, Melting, Warming, or any other Action on the Body itſelf, as Amber, Sealing-Wax, Glaſs, Reſin, Sulphur, *&c.* beſides many, if not all, Animal Subſtances.

## DEFINITION II.

A *Non-electrical* is ſuch a Body as cannot be made electrical by any Action upon the Body itſelf im-

immediately; though it is capable of receiving that Virtue from an *Electrical per ſe.*

### OBSERVATIONS.

1. When the Air is full of moiſt Vapours, *Electricals per ſe* are excited to Electricity with very great Difficulty, requiring to be often warm'd, and much rubb'd; as appears in exciting that Virtue in Glaſs, Amber, Wax, *&c.*

2. In dry Weather, eſpecially in froſty Weather, the *Electricals per ſe* will have their Virtue excited with very little Action upon them; as appears by warming a Glaſs Receiver, which, without any rubbing, will cauſe the Threads of a Down Feather, tied to an upright Skewer, to extend themſelves as ſoon as it is put over the Feather. Sometimes Reſin and Wax exert their Electricity by only being expos'd to the open Air.

3. *Electricals per ſe* retain the Virtue longeſt when kept near to, or inclos'd by, other *Electricals per ſe.* Thus the rubb'd Tube will retain its Virtue pretty long in dry Air, as appears by chaſing a Feather about the Room very long without new rubbing; as alſo by Lumps of Reſin and Sulphur, *&c.* which have been melted and poured into dry Drinking-glaſſes, keeping their Virtue long, if kept in thoſe Glaſſes, and wrapp'd in dry Silk, or ſuch ſort of Paper as will become electrical by rubbing; for as often as they are expos'd to the Air, they will attract.

4. *Electricals per ſe* communicate their Virtue to any of the *Non-electrical,* when brought near them; in which Caſe the *Non-electricals* attract and repel like

like the *Electricals per ſe*. Thus an Iron Bar ſuſpended by a ſilken Thread, an Hair Rope, or a dry Cat-gut, when an excited *Electric per ſe* is brought near it, will both attack and ſend out its *Effluvia* to a *Non-electric* held near it; as appears in the Dark by the Light coming out at the End of the Bar.

5. An *Electrical per ſe* loſes its excited Virtue in communicating to the *Non-electrical*; and the ſooner, the more of thoſe Bodies are near it. Thus in moiſt Weather the rubb'd Tube holds its Virtue but a little while, becauſe it acts upon the moiſt Vapours that float in the Air; and if the rubb'd Tube be applied to Leaf-Gold or Braſs, laid upon a Stand, it will act upon it much longer, and more ſtrongly, than if the ſame Quantity of Leaf-Gold is laid upon a Table, which has more *Non-electrical* Surface than the Stand.

6. When a *Non-electrical* is ſuſpended by, or only touches an *Electrical per ſe*, it receives the Properties of an *Electrical per ſe* from a rubb'd Tube or Wax, *&c*. This appears by the Fire that flaſhes from the Fingers of a Man ſuſpended by Hair-Ropes, or who ſtands upon a Cake of Reſin, when he has receiv'd Virtue from the rubb'd Tube.

7. The Virtue which a *Non-electrical* receives from a rubb'd Tube, runs on to the moſt diſtant Part of the ſuſpended Body from the Place where the Tube is applied, and ſeems to be collected there, from whence it flaſhes in the Dark, ſnaps, and exerts its Attraction upon the Thread of Trial; though as the Virtue runs along, it ſometimes ſhews itſelf in other Parts of the ſuſpended *Non-electrical*.

8. If a *Non-electrical*, whilſt it is receiving the Virtue from the rubb'd Tube, be made to communicate with the Floor of the Room, or any other great *Non-electrical* Body by a *Non-electrical* String, how ſmall ſoever, (though but a Thread) the Virtue will not ſhew itſelf, as it did before, at the Extremities, where the Flaſh of Light was ſeen.

9. If a *Non-electrical* be ever ſo big, when ſuſpended, it will receive Electricity from the rubb'd Tube. And if five or ſix hundred Foot long, when the rubb'd Tube is applied at one End, the Bodies hanging at the other End will become electrical. This has been tried by ſeveral People as well as myſelf.

10. If a long *Non-electrical* String be faſten'd to an *Electrical per ſe*, and extended to a great Diſtance, being ſupported by *Electricals per ſe* to keep it from touching the Ground, all Bodies faſten'd at the End of it will become electrical when the rubb'd Tube is applied at the other End, though the Tube does not touch it, but is only brought within two or three Inches of it.

*N. B.* This String we have before called the *Conductor of Electricity*, and the Cat-gut or ſilken Strings, Glaſs Tubes, or whatever kept the long String from touching the Ground, *Supporters*.

If any of the *Supporters*, mention'd in the laſt Obſervation, be chang'd for a *Non-electrical* Supporter, the Virtue will there be ſtopp'd and taken away by that *Supporter*: But if that *Supporter* be again ſupported by *Electricals per ſe*, it will only receive ſo much Electricity as will impregnate it, and then the Virtue

Virtue will go on to the End of the String, and impregnate the Bodies faſten'd to it.

12. The *Non-electricals* receive the greateſt Virtue at the End of the String, and moſt of all, if they are wet. But the *Electricals per ſe*, if long Bodies, as long Sticks of Wax, and Glaſs Tubes, only become electrical at the End next to the String.

13. *Electricals per ſe* will become *Non-electricals*, if they be wet, or only moiſten'd. Thus Supporters that tranſmit the Electricity immediately, ſtop it when wet with a Sponge, or when blown through, if open Tubes. And if the long *Electricals per ſe*, hanging at the End of the Conductor, be made wet, they will become *Non-electricals*, and ſtrongly receptive of the Virtue given by the rubb'd Tube at the other End of the String.

*N.B.* All the ſix Experiments mention'd in the Beginning of this Paper, confirm this Obſervation.

14. A *Non-electrical* having been impregnated with Electricity by the rubb'd Tube, is repell'd by it, till it has loſt its Electricity by communicating it to another *Non-electrical.* Then being in its firſt State, it is again attracted by the Tube, which holds it till it has fully impregnated it; then it repels it again. This is evident, by attracting a Down Feather by the Tube in the Air, and then repelling it; ſo as to make it dance backwards and forwards to and from a Finger held up at a Foot or two from the Tube. But the Thing appears more plainly from the following

### EXPERIMENT VII.

Having rubb'd the Tube *Tt*, (ſee TAB. I. Fig. II.) and with it attracted a Feather, the Feather at *t* was repell'd from the Tube, whenever it was brought near it; but ſuddenly dipping the End *T* of the Tube in Water, the Feather floating in the Air came to it again, and ſtuck to the End of the Tube at *T* or near *F*.

*N. B.* In fair Weather this Experiment will not ſucceed, unleſs the Tube be thruſt pretty deep into Water (a Foot at leaſt); but in moiſt Weather an Inch or two will do.

*P. S.* Though animal Subſtances be generally thought to be *Electrical per ſe*, yet it is only when they are very dry: This is the Reaſon why a living Man ſuſpended by a Hair Rope, or ſtanding upon a Cake of Reſin, to receive Electricity from the Tube, muſt be conſider'd as a *Non-electrical*, by reaſon of the Fluids of his Body.

*N. B.* The above Obſervations, together with the *Queries* in my former Papers, will be further illuſtrated by ſome Experiments which I do not now mention, becauſe I have only try'd them at home; but when I have try'd them before the ROYAL SOCIETY, I ſhall give an Account of them in Order.

*Philosoph. Transact. N°. 454.* **TAB. I.**

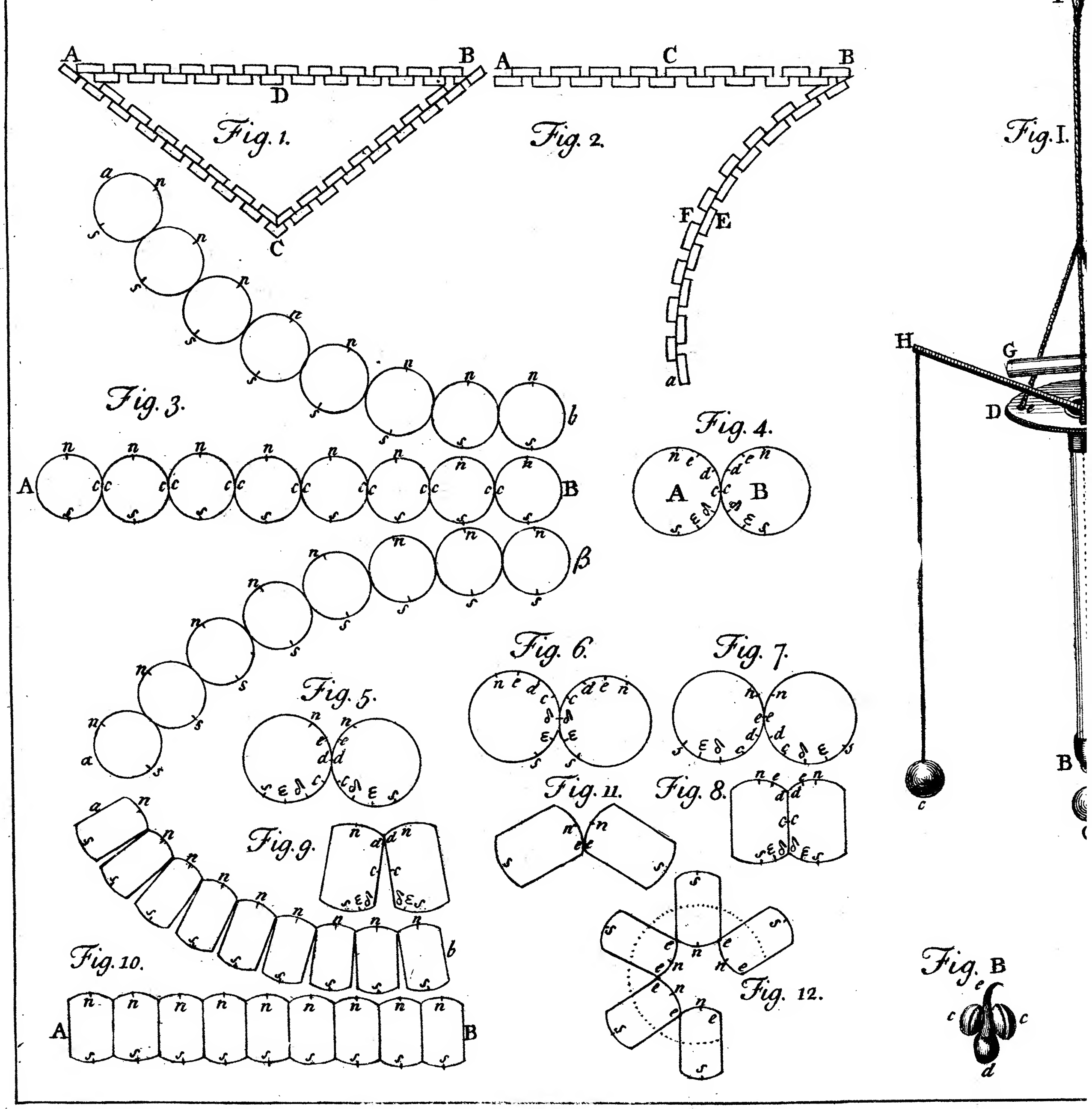


*Fig.* I.

*Fig.* II.

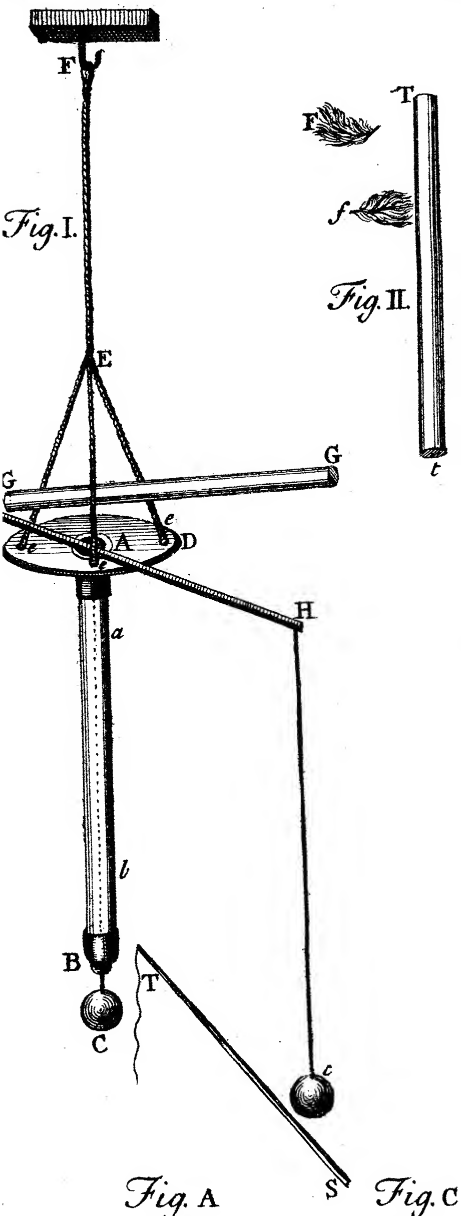


*Fig.* A

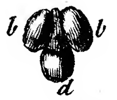
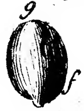


*Fig.* C



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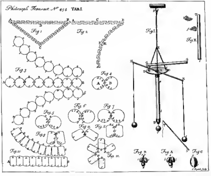
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Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
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Fig. 12
Fig. I
Fig. II
Fig. A
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